Remarks

Claims 1 and 11 are amended and claim 12 is added. Claims 1 to 12 are pending in this application of which only claims 1 and 11 are in independent form.

Applicant's attorney thanks Examiner Cadugan for the telephone interview held on February 15, 2006. During the interview, the new matter issue referred to in the advisory action mailed on January 27, 2006 was discussed and it was mutually agreed that there is sufficient antecedent basis for claim 1 as shown in the amendment after final action filed on January 17, 2006 but not entered. Accordingly, the objection raised under new matter was withdrawn.

Also, it was mutually agreed that the claims as shown in the amendment after final action patentably distinguish the applicant's invention over Linderholm.

During the interview, Examiner Cadugan advised applicant's attorney of two references, namely, United States Patent 3,757,637 (Eich et al) and United States Patent 5,697,739 (Lewis et al) and suggested that we comment on these references. Accordingly, the applicant has reviewed these two references and submit their comments thereon starting at page 12 of these remarks.

Claim 1 had been rejected under 35 USC 102(b) as being anticipated by Linderholm. The following will confirm that claim 1, as amended, patentably distinguishes the applicant's invention over this reference.

The applicant's invention proceeds from the state of the art set forth in the introduction of the applicant's disclosure wherein a driveable work tool at the free end of a work tool holder is introduced into the cylinder for forming the control windows in the cylinder wall of a cylinder housing of an internal combustion engine, and via a transverse movement relative to the rotational axis of the tool holder, is brought into engagement with the cylinder wall. This state of the art described by the applicant is also set forth in the newly cited Japanese reference JP-58-155114 (please see FIGS. 1 and 2) and United States patent publication US 2005/0166396 A1 (Brockel et al) (see FIGS. 3 and 4). Both publications disclose arrangements wherein a rotatable milling head is introduced into the interior of a cylinder and a machining of the cylinder wall takes place for forming a control window via transverse movement of the tool holder. The rotational axis of the tool holder is coincident with the drive axis of the mounted work tool for every conceivable operating position.

In contrast to this state of the art, the applicant's invention distinguishes itself by an arrangement of the work tool on the work tool holder wherein the drive axis of the work tool is orthogonal to the rotational axis of the work tool holder.

Accordingly, the newly cited references lie still farther away from the applicant's invention and show only special configurations of a cutting tool

The orthogonal arrangement of the cutting tool ensures a high precision of the machining operation when cutting out the control window and permits a desired angular configuration of the

edge of the control window. This is precluded by the known cutter units because they can only be brought into contact engagement with the workpiece at the periphery of the cutting head.

The applicant respectfully submits that Linderholm discloses no arrangement of the cutting tool with a drive axis or rotational axis lying orthogonally to the rotational axis of the tool holder. The Examiner is correct in that Linderholm goes beyond the other applied references insofar as the rotational axis of the tool holder of Linderholm is not perforce coincident with the drive axis of the cutting tool.

In the known arrangement, an adjusting device is provided with which the cutting tool can be displaced eccentrically. In each possible position, however, and in contrast to the applicant's invention, the rotational axis of the cutting tool always lies parallel to the rotational axis of the tool holder. According to the view expressed in the action, in the case of an eccentric position of the tool axis in Linderholm, the work tool carries out a circular movement about the holder axis and therefore moves in a plane perpendicular to the plane of the drawings as noted on page 7 of the action.

The applicant respectfully submits that this conclusion is based on an error because the axis, which moves eccentrically on a circular path, describes a rotational body about the axis of the tool holder. The applicant notes that a rotational movement of a line excludes a straight line movement of the axis in a plane. The axis of the circularly moving work tool of Linderholm therefore does not move orthogonally to the axis of the work tool

holder; instead, it moves about this axis in a peripheral direction always at the same radial distance. Accordingly, this axis always lies parallel to the axis of the work tool holder.

It is indeed correct that in the arrangement of Linderholm, and for eccentrically displaced tool axis, a circular movement about the axis of the work tool holder is superposed on the work movement of the work tool. It is precisely because of this circular work movement in Linderholm that cutouts for attachment bolts are bored with greater dimensions than the work tool diameter for thin and corrugated composite materials (see column 1, starting at line 10). However, in this, no work movement takes place about a drive axis which lies orthogonally to the work tool axis as in the applicant's invention and as set forth in applicant's claim 1:

> "a driveable cutting tool mounted on said tool holder at said free end thereof and having a drive axis lying essentially orthogonally to said rotational axis;" (emphasis added)

It cannot be seriously doubted that with the term "drive axis" generally the center of a rotational movement is defined. The term "drive axis" therefore describes clearly the axis at the center of the rotational work movement of the cutting tool.

The two axes of the superposed rotational movement of the bore work tool of Linderholm lie parallel. Even in accordance with the terminology of Linderholm, the description there is of a parallel position of the axis of the work tool holder (principal axis 54) and the drive axis of the work tool (tool axis 26). The first and second rotational axes are in column 3, starting at line 36, of this reference.

In the applicant's arrangement, the work tool is clearly arranged so that the drive axis of the work tool (that is, the axis about which the work movement of the cutting tool takes place) is orthogonal to the rotational axis of the work tool holder which is likewise rotationally moveable as clearly set forth in claim 1 with the clause:

> "a tool holder having a free end and defining a rotational axis about which said tool holder can be rotated;" (emphasis added)

The above is clearly not the case in Linderholm.

For a better understanding of the applicant's invention, applicant notes that the tool holder functions only to position the work tool and not to drive the work tool. Precisely this situation that the work movement of the cutting tool of the applicant's invention is not perforce determined by a rotational movement of the work tool holder ensures a high precision of the machining operation when manufacturing the control window in an engine cylinder and permits a desired angular configuration of the edge of the control window to be made. This is not possible with the cutting tool of the state of the art.

The applicant especially disagrees with the conclusion advanced in the action that the teaching of Linderholm would not negate a use of the arrangement thereof to form control windows in a cylinder as set forth on page 9 of the action. Applicant respectfully asks what relevance the parallellity of the axes in Linderholm have for the possibility of a radial machining of the cylinder wall.

The Examiner confirms that the configuration of control

windows are not suggested in this reference. Furthermore, it cannot be seriously doubted that the arrangement of Linderholm is provided to bore holes and not to machine a radial cylinder wall. Machining in a radial direction is considered but, for this purpose, the periphery of the work tool is utilized whose drive axis lies parallel to the main axis. In a hypothetical use in the area of application of the invention, namely, the machining of control windows, the drilling work tool could not come into contact with the cylinder wall in an eccentric position of the parallel axes because the chuck 20, which is always necessary, would not permit the work tool to come so close. In view of the above, applicant confirms that the arrangement of Linderholm with a work tool axis, which lies parallel to the main axis, is constructively precluded from machining cylinder walls.

In view of the foregoing, applicant submits that a person of ordinary skill would not seek out Linderholm to find a solution for machining control windows in the wall of a cylinder housing.

Applicant has shown how the driveable cutting tool of the applicant's invention is arranged to the work tool holder and this is different from the arrangement of Linderholm. The cutting tool is expressly defined in claim 1 as having a drive axis lying orthogonally to the axis of the tool holder and no suggestion for this configuration is provided in Linderholm.

For the reasons advanced above, applicant submits that the conclusion reached at the interview is indeed correct so that claim 1 now patentably distinguishes his invention from Linderholm and should now be allowable as should claim 11 which essentially parallels claim 1.

Comments as to United States Patent 3,757,637 (Eich et al) and 5,697,739 (Lewis et al)

Lewis et al and Eich et al were mentioned as being references of interest during the telephone interview of February 15, 2006 and the Examiner asked the applicant to review the same and comment thereon. Accordingly, the applicant now presents his comments on these two references.

Lewis et al shows a spindle arrangement having a vertically moveable spindle on which a tool is mounted. The tool is rotatable about a horizontal axis and is held in a tool head which is fixed to the spindle via a flange. The rotational position of the flange on the spindle stock is secured via a spring-biased bolt (identified by reference numeral 63 in FIG. 2). A rotation of the spindle during operation about the rotational axis identified in FIG. 2 by reference character B is therefore not possible.

In the arrangement shown in FIGS. 4 to 6 of Lewis et al, only a fixed adjustment of the angular position between the tool head and the intermediate flange is possible. For this purpose, threaded bolts (shown in FIG. 5) are arranged in slots which extend in the peripheral direction. An adjustment of the alignment of the tool head during operation and a pivot movement of the entire tool head about the spindle axis is not possible in Lewis et al.

Eich et al shows a horizontally aligned tool which is driven by a vertically aligned spindle. For the drive, the spindle has driving blocks 16 which coact with slots 15a on the tool head. The tool head itself is fixed on the spindle housing 1. The

clamping pins 10 shown in FIG. 1 are provided for this purpose. As described at column 3, line 65, to column 4, line 1, the milling tool head can be fixed in four different positions on the spindle housing spaced 90° apart about the spindle axis. A rotation of the milling head with the tool holder (that is, the spindle) is not provided for in Eich et al. Rather, the spindle functions to drive the tool while the housing of the tool head is fixed on the spindle housing.

A pivoting of the tool head during operation is not possible either with the arrangement of Eich et al or with the arrangement of Lewis et al. In order to emphasize this difference of the applicant's invention with greater clarity, claim 1 is amended herein to include the clause:

> "said driveable cutting tool being driveable by pivot movements (12) of said tool holder (17) about said rotational axis (11) into a desired angular position with respect to said cylinder wall." (reference numerals added)

The above clause makes clear that the cutting tool can be brought into a desired rotational position relative to the cylinder wall via pivot movements of the tool holder. The antecedent basis in the applicant's disclosure for this feature can be found on page 7, lines 26 to 28.

Claim 12 is added to provide another definition of the applicant's invention and is directed to the feature that the cutting tool is moveable via controlled movements of the tool holder in transverse movements as well as pivot movements so that a widening of the control window is possible.

In view of the foregoing, applicant submits that claims 1

to 12 should also patentably distinguish their invention over Lewis et al and Eich et al and be allowable.

Reconsideration of this application is earnestly solicited.

Respectfully submitted,

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